

REMARKS

This is a full and timely response to the outstanding non-final Office Action mailed November 2, 2005 (Paper No. 103005). Upon entry of this response, claims 46-50 are pending in the application. In this response, claim 46 and 50 have been amended. Applicants respectfully requests that the amendments being filed herewith be entered and request that there be reconsideration of all pending claims.

1. **Rejection of Claims 48 and 49 under 35 U.S.C. §112, Second Paragraph**

Claims 48 and 49 have been rejected under 35 U.S.C. §112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which Applicants regard as their invention. The Office Action states that:

Specifically, the language within lines 4 and 5 of claim 48 is unclear with respect to what is being reacted. The language “reacting a compound obtained by reacting a compound (eb) with a compound (fb) and further reacting with a compound (i)”, is confusing, because it cannot be determined what is being initially reacted with the “obtained” compound, since compound (i) is claimed as being “further” reacted. In other words, there appears to be too many occurrences of “reacting.”
(Office Action, p. 2)

Independent claim 48 is amended to further clarify the subject matter which Applicants regard as their invention. Applicants respectfully submit that the amendment overcomes the rejection of claims 48 and 49, and requests that the rejection be withdrawn.

2. **Rejection of Claims 46 and 47 under 35 U.S.C. §103**

Claims 46 and 47 have been rejected under §103(a) as allegedly obvious over *Barron* (U.S.4,067,844) or *Zwiener* (U.S. 5,364,955). Applicant respectfully traverses the rejection of claims 46 and 47. It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of

references must disclose, teach, or suggest, either implicitly, all elements/features/steps of the claim at issue. *See, e.g., In re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988); *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

a. Claim 46

The Office Action takes the position that “the respective processes [of *Barron* and *Zwiener*] yield the same product and the only difference amounts to changing the sequence of steps in a multi-step process, and it has been held that such a modification is obvious where an unexpected result is not obtained.” (Office Action, p. 3, section 4.) As will be explained in more detail below, Applicants respectfully disagree with this characterization of the references as yielding the same product as claims 46 and 47.

1) *Barron* and *Zwiener* Produce a Side Reaction

As argued in the last Office Action, both *Barron* and *Zwiener* disclose that a prepolymer is produced in step (2) of their respective processes. Applicants also argued that because a prepolymer is produced a side reaction such as dimerization and trimerization of urethane prepolymer inevitably occurs, so that a product produced by *Barron* or *Zwiener* has high molecule and high viscosity. (See Response filed Aug. 3, 2005, p. 8). In contrast, the process of claim 46 dispenses with the step of producing a prepolymer, and a product of claim 46 has low viscosity. Thus, the process of claim 46 differs in a non-obvious way from the processes disclosed in *Barron* and *Zwiener*.

The outstanding Office Action stated that Applicants’ arguments about side reactions were unsubstantiated opinion, since no evidence or logical rationale was provided to support Applicants’ position. (Office Action, p. 4.) Applicants provide herein both logical rationale and experimental data supporting Applicants’ position with regard to side reactions.

In a reaction process like *Barron* and *Zweiner*, when a polyisocyanate is reacted with a polyol, a prepolymer is produced. If this reaction progresses ideally, the NCO terminated prepolymer (basic unit) is obtained with reaction of two polyisocyanate molecules and one polyol molecule. However, as shown by experimental data in Appendix A-1, a dimer (double unit) and trimer (triple unit) which has twice or three times of molecular weight are also produced by side reactions, due to both polyisocyanate and polyol being multi-functional compounds. Accordingly, the final prepolymer product contains a large amount of high weight molecule.

This is evidenced by the experimental data presented in Appendices A and B. Appendix A is a Japanese language article from a 1996 issue of "Adhesion Technology Japan", and Appendix B is the English translation of Table 3-18. Dimerization and trimerization in prepolymer production are clearly seen in the data of Appendix A/B, which will now be explained in detail. Table 3.18 shows the GPC (Gel Permeation Chromatography) charts of the prepolymer, with various isocyanate group contents which have been obtained using the same polyol (molecular weight 3000 of PPG) and polyisocyanate (polymeric MDI). In the Table, "iso monomer" means isocyanate monomer, "iso dimer" means dimer of isocyanate, "iso trimer" means trimer of isocyanate, "iso tetramer" means tetramer of isocyanate, "basic unit" means monomer or basic unit (prepolymer), "pre dimer" means dimer (double unit) of prepolymer, and "pre trimer" means trimer (triple unit) of prepolymer.

In the Table, chart (a) shows the prepolymer (15% isocyanate group content) which is obtained by 2:1 reaction with NCO group of polyisocyanate and OH group of polyol. Even in such prepolymer prepared at the theoretical reacting ratio, peak (7) of "pre dimer (double unit)" is observed. Further, as the isocyanate group content in the prepolymer is decreased from 15% to

6% the content of “pre dimer (double unit)” (7) and “pre trimer (triple unit)” (8) is increased. In any case where isocyanate group content is 15%, 9% or 6%, the dimer and/or trimer exist in the prepolymer product.

In other words, the side reaction, that is, production of dimerization and trimerization, *inevitably* occurs in producing a prepolymer by reacting a polyisocyanate with a polyol. Accordingly, an actual pre-polymer composition has higher molecule weight and higher viscosity than those of the ideal basic unit. Also, the final product or resin compositions, which use the prepared prepolymer as raw materials, have high viscosity. As is apparent from the above, the occurrence of side reactions is already known, and is supported by Appendix A/B.

The process of claim 46 therefore differs in a non-obvious way from the processes disclosed in *Barron* and *Zwiener*. Accordingly, a *prima facie* case establishing an obviousness rejection under *Ex parte Rubin* has not been made. For at least these reasons, claim 46 is not obvious over *Barron* or *Zwiener*, and the rejection should be withdrawn.

2) *Barron* and *Zwiener* Produce a Different Product than Claim 46

As argued in the last Office Action, according to the process disclosed in *Barron* and *Zwiener*, the urethane polymer has a hydrolysable silyl group and a NCO group in the terminal. On the other hand, the product of claim 46 has a hydrolysable silyl group and an OH group in the terminal. (See Response filed Aug. 3, 2005, pp. 8-9.) Thus, the products of *Barron* and *Zwiener* are different from the product of claim 46.

The outstanding Office Action stated that “applicants’ arguments are largely based upon the position that the instant products have an OH group in the terminal; however, applicants’ claims are not so limited. There is no requirement that such a terminal OH group exists or be produced.” (Office Action, p. 4.) Applicants provide herein a logical rationale supporting Applicants’ position.

Considering the process of the reaction, it is clear to one of ordinary skill in the art that the product by the process of claim 46 necessarily contains hydrolysable silyl group terminated polymer, and may in some circumstances contain OH group terminated polymer. However, applicants do not limit the product of claim 46 to the products having a terminal OH group. Applicants' reference to the "OH group" in the last response was made to emphasize the difference from *Barron* and *Zwiener*. The final product of claim 46 is hydrolysable silyl group terminated polymer, and if all ends of polyol do not react, the product may have a terminal OH group. That is simply an issue of possibility or probability.

Specifically, the process of Claim 46 comprises (1) obtaining a silicon compound (product (N)) having an active hydrogen being reactive with a isocyanate group, (2) reacting the product (N) with a compound (G) having an NCO group to obtain a silicon compound (product (O)) having a NCO group, and (3) reacting the product (O) with a compound having an OH group. The final product is hydrolysable silyl group terminated polymer. and if all ends of polyol do not react, the product may have a terminal OH group. See Appendix C.

In contrast, reactions in the references are different from the present invention. The process of *Barron* comprises the steps of (1) obtaining an aminosilane, (2) reacting a polyol compound with a polyisocyanate compound to produce a urethane prepolymer, and (3) reacting the aminosilane with the urethane prepolymer. (Col. 2, lines 59-66 and Col. lines 37-50.) The final product contains components of higher molecule weights and has hydrolysable silyl group, but it cannot possibly have a terminal OH group. See Appendix E.

Further, the process of *Zwiener* comprises the steps of (1) reacting a polyol compound with a polyisocyanate compound to produce a urethane prepolymer, (2) obtaining an aminosilane, and (3) reacting the amino silane with the urethane prepolymer (Examples 5 and 8).

The final product contains components of higher molecule weights and has hydrolysable silyl group, but cannot possibly have a terminal OH group. See Appendix F.

In summary, none of the cited references disclose, teach, or suggest the product of claim 46.

b. Claim 47

Since independent claim 46 is allowable, Applicants respectfully submit that claim 47 is allowable for at least the reason that it depends from an allowable claim. *In re Fine*, 837 F.2d 1071, 5 U.S.P.Q. 2d 1596, 1598 (Fed. Cir. 1988). Therefore, Applicants respectfully request that the rejection of claim 47 be withdrawn.

3. Rejection of Claim 50 under 35 U.S.C. §103

Claim 50 has been rejected under §103(a) as allegedly obvious over *Krafcik* (U.S. 5,614,604). Applicants respectfully submit that the claim amendments made herein overcome the objection. It is well established at law that, for a proper rejection of a claim under 35 U.S.C. §103 as being obvious based upon a combination of references, the cited combination of references must disclose, teach, or suggest, either implicitly, all elements/features/steps of the claim at issue. *See, e.g., In re Dow Chemical*, 5 U.S.P.Q.2d 1529, 1531 (Fed. Cir. 1988); *In re Keller*, 208 U.S.P.Q.2d 871, 881 (C.C.P.A. 1981).

1) *Krafcik* Produces a Side Reaction

In a reaction process like *Krafcik*, when a polyisocyanate is reacted with a polyol, a prepolymer is produced. If this reaction progresses ideally, the NCO terminated prepolymer (basic unit) is obtained with reaction of two polyisocyanate molecules and one polyol molecule. However, as shown by experimental data in Appendix A-1, a dimer (double unit) and trimer (triple unit) which has twice or three times of molecular weight are also produced by side

reactions, due to both polyisocyanate and polyol being multi-functional compounds.

Accordingly, the final prepolymer product contains a large amount of high weight molecule.

This is evidenced by the experimental data presented in Appendices A and B, introduced above. In Table 3-18 of Appendix A/B, chart (a) shows the prepolymer (15% isocyanate group content) which is obtained by 2:1 reaction with NCO group of polyisocyanate and OH group of polyol. Even in such prepolymer prepared at the theoretical reacting ratio, peak (7) of “pre dimer (double unit)” is observed. Further, as the isocyanate group content in the prepolymer is decreased from 15% to 6% the content of “pre dimer (double unit)” (7) and “pre trimer (triple unit)” (8) is increased. In any case where isocyanate group content is 15%, 9% or 6%, the dimer and/or trimer exist in the prepolymer product.

In other words, the side reaction, that is, production of dimerization and trimerization, *inevitably* occurs in producing a prepolymer by reacting a polyisocyanate with a polyol. Accordingly, an actual pre-polymer composition has higher molecule weight and higher viscosity than those of the ideal basic unit. Also, the final product or resin compositions, which use the prepared prepolymer as raw materials, have high viscosity. As is apparent from the above, the occurrence of side reactions is already known, and is supported by Appendix A/B.

Because a prepolymer is produced a side reaction such as dimerization and trimerization of urethane prepolymer inevitably occurs, so that a product produced by *Krafcik* has high molecule weight and high viscosity. In contrast, the process of claim 50 dispenses with the step of producing a prepolymer, and a product of claim 50 has low viscosity. Thus, the process of claim 50 differs in a non-obvious way from the processes disclosed in *Krafcik*. Accordingly, a *prima facie* case establishing an obviousness rejection under *Ex parte Rubin* has not been made.

For at least these reasons, claim 50 is not obvious over *Krafcik*, and the rejection should be withdrawn.

2) *Krafcik* Produces a Product without a Terminal OH Group

As argued in the last Office Action, according to the process disclosed in *Krafcik*, the terminal of the polymer of *Krafcik* is hydrolysable silyl group, or an alkyl group connected with a urethane linkage, and the hydrolyzed silyl group is hydrolyzed with water. In contrast, the terminal of the product of claim 50 is a hydrolysable silyl group and an OH group. (See Response filed Aug. 3, 2005, pp. 8-9). Thus, the product of *Krafcik* is different from the product of claim 50.

The outstanding Office Action stated that “applicants’ arguments are largely based upon the position that the instant products have an OH group in the terminal; however, applicants’ claims are not so limited. There is no requirement that such a terminal OH group exists or be produced.” (Office Action, p. 4.) Applicants provide herein a logical rationale supporting Applicants’ position.

Considering the process of the reaction, it is clear to one of ordinary skill in the art that the product by the process of claim 50 necessarily contains hydrolysable silyl group terminated polymer, and may in some circumstances contain OH group terminated polymer. However, Applicants do not limit the product of claim 50 to the products having a terminal OH group. Applicants’ reference to the “OH group” in the last response was made to emphasize the difference from *Krafcik*. The final product of claim 50 is hydrolysable silyl group terminated polymer, and if all ends of polyol do not react, the product may have a terminal OH group. This is simply an issue of possibility or probability.

In contrast, reactions in the references are different from the present invention. The process of *Krafcik* comprises the steps of (1) producing a urethane prepolymer, (2) reacting an

NCO group of the urethane prepolymer with an alcohol and an aminosilane, and (3) charging water (Col. 5, line 31 to Col. 6, line 9). The final product has no terminal OH group. The final product contains components of higher molecule weights and has hydrolysable silyl group, but it cannot possibly have a terminal OH group. See Appendix G. In summary, *Krafcik* does not disclose, teach, or suggest the product of claim 50.

3) Amended Claim 50 Produces a Moisture Curable Product

Applicants argued in the last response that the product of claim 50 differs from the product of *Krafcik* in that *Krafcik* is directed to a polyurethane dispersion, while the product of claim 50 is directed to a moisture curable product. The outstanding Office Action indicated that Applicants' argument "does not distinguish the claim from the prior art. Nothing in applicants' claim requires the product to be moisture curable... The claim is open to virtually any step or modification." (Office Action, p. 5, section 8.)

Claim 50 has been amended to recite "A process for the preparation of *moisture curable* urethane resins... " Therefore, even if Applicants' claimed process was analogous to changing a sequence of steps, Applicants' claimed process produces unexpected results. Therefore, a *prima facie* case establishing an obviousness rejection under *Ex parte Rubin* has not been made. For at least these reasons, claim 50 is not obvious over *Krafcik*, and the rejection should be withdrawn.

CONCLUSION

Applicants respectfully request that all outstanding objections and rejections be withdrawn and that this application and presently pending claims 46-50 be allowed to issue. If the Examiner has any questions or comments regarding Applicants' response, the Examiner is encouraged to telephone Applicants' undersigned counsel.

Respectfully submitted,

**THOMAS, KAYDEN, HORSTEMEYER
& RISLEY, L.L.P.**

By:



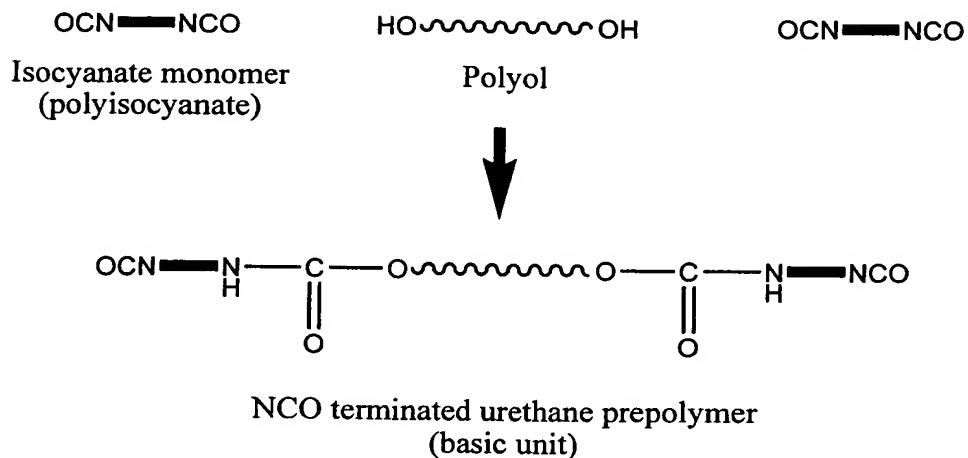
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Appendix A-1

Ideal Reaction [NCO : OH = 2 : 1]



Side Reaction (Actual Reaction) [NCO : OH = 2 : 1]

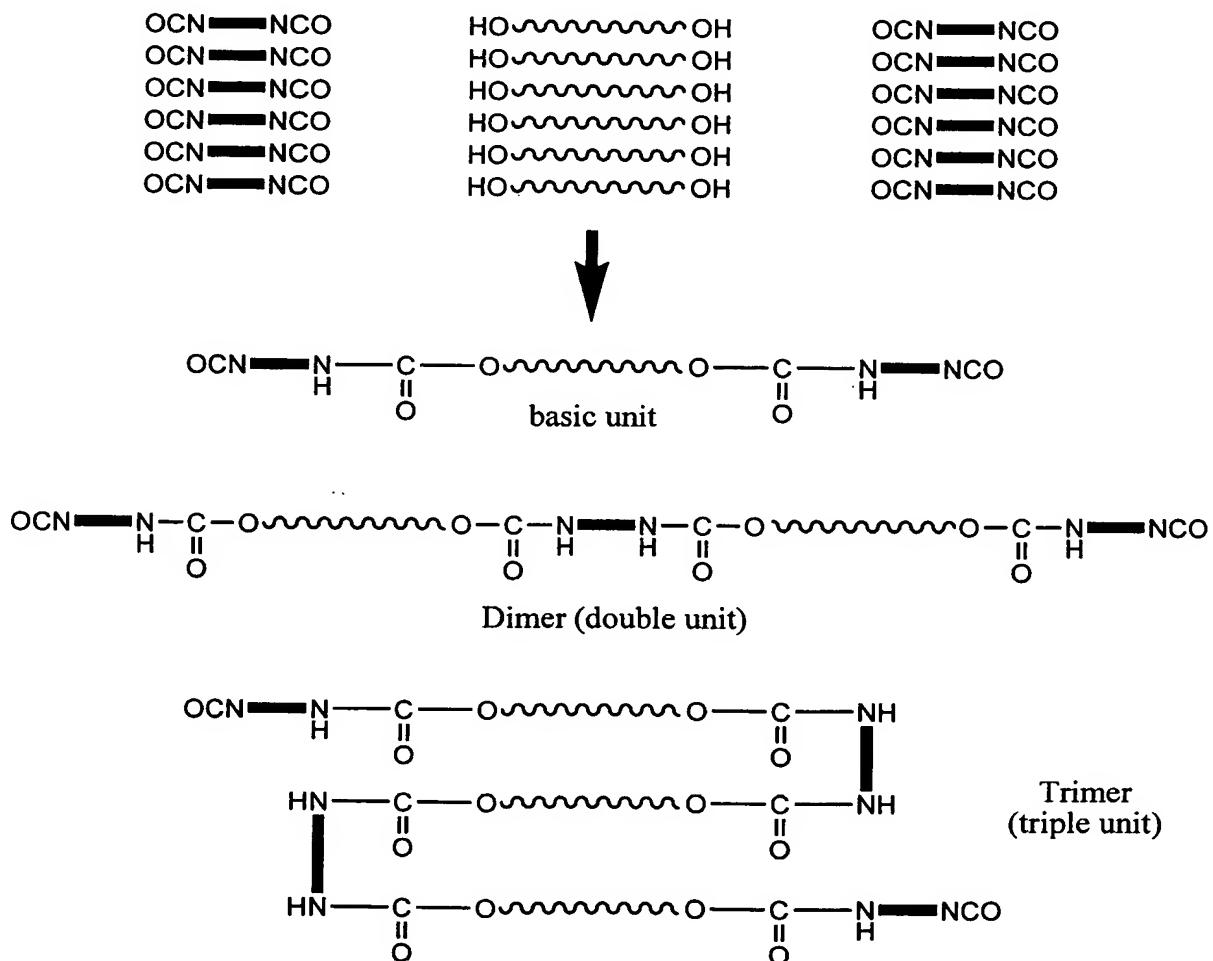


表3.15 接着剤用イソシアネート原料⁴⁾

表3.16 プレポリマーの構造と硬さ

難易度	低い	高い
曲加減系	労音系	労音系
ジオーナー	トリオール	トリオール
エーテル系	労音系	労音系
低	高	高
低	高	高

表3.17 領料ボリュームとレタントプレボリマーの特性について

分子量	〔吸全 NCO%残余〕	PPG 領
皮膜	軽質ウレタン (樹脂ポリマー)	トリオール

NCO/OH	アレボリマー分子量 粘度 柔軟性/シニアネート	NCO/OH比 2	④ 4重体 粘度 柔軟性/シニアネート	⑤ 3重体 粘度 柔軟性/シニアネート
BL-9010E 高 柔軟性/シニアネート	少	多	少	多

表3.18. インジアネット基含有率のプレポリマーフラグメントに及ぼす影響

卷之三

3.3.3.6 一般強度強化型クリターン系接着剤の性能
このタイプはアクリル樹脂を、多く半透明の
最適添加剤に付ける VOC (Volatile Organic
Compound) が規制にみられる部分の排出規制強化
基準規制の規制範囲にあることは国内での測定法改正へ
対応したとしての強度強化がかけられており一般強度
型クリターン系接着剤もその要求に答えて行くこ
とが可能である。この強度強化型クリターン系接着剤は
木質木材強化アクリル接着剤の強度を3.19に示
す。半透明の
3.3.5.1 他の及びアクリルシンナー
木質木材強化アクリル接着剤の
強度を3.19に示す。

- 雨水接続強さ一基管 (20℃×60%RH)：で抜水、7日間養生、20℃の水に7日間浸漬
- 加熱蒸気接続強さ一基管 (20℃×60%RH)：で抜水、7日間養生、70℃オープン70℃オープン70℃

卷之三

平明報

卷之三

接続部：燃料加工装置ボリュメトリック/フローリング/フレキシブルホース

大型ウレタン系接着剤の特性		KU109S/105	
接着剤	接着剤	接着色ベースト	接着色ベースト
パネル用 KU-1 質白色ベースト	100	95以上	95以上
パネル用 KU-1 10000(W)	11.	17000(S)	12000(W)
パネル用 KU-1 1.5~1.6 ナシ/ナシ	1.5~1.6	1.5~1.6	第四回第 2 石油顔料/ナシ
ビード強度 (ラボルラシガラ)	ビード強度	ビード強度	ビード強度
各種木質接着剤 パネルショット用	各接着剤 パネルショット用	自動及びハンド ハンド	自動及びハンド ハンド
接着剤用1液速	接着剤用1液速	接着剤用 パネル接合用	接着剤用 パネル接合用

特殊加工高強度ポリエチレン		特殊加工高強度ポリエチレン	
18	1.9	60	5.2
14	1.3		66.8
14	1.5		66.8
合計		合計	

熱湯、7日間投射、20℃の水に7日間投射
で接着、7日間発生、70℃オープン、70℃に30日間放置
オープンタイム：5分（20℃）

卷之三

品名	KUGOGAWA					
	4858回	7258回	1218回	2418回	3618回	4818回
60分	90分	15分	30分	45分	60分	90分
—	—	54.5	54.5	49.5	58.6	56.5
53.5	53.5	47.4	47.4	47.4	48.4	45.1
50.0	50.0	24	24	—	—	—

レギュラーフレッシュアルボン

接種の技術 [3]

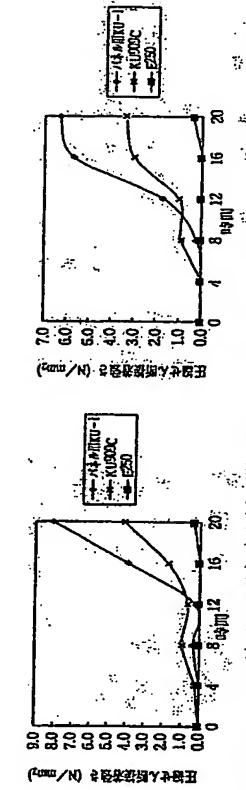


図3.23 0℃に於ける圧縮せん断接着強さ(米マツ)

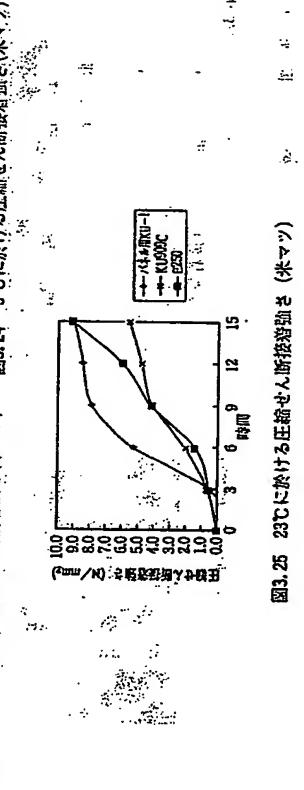
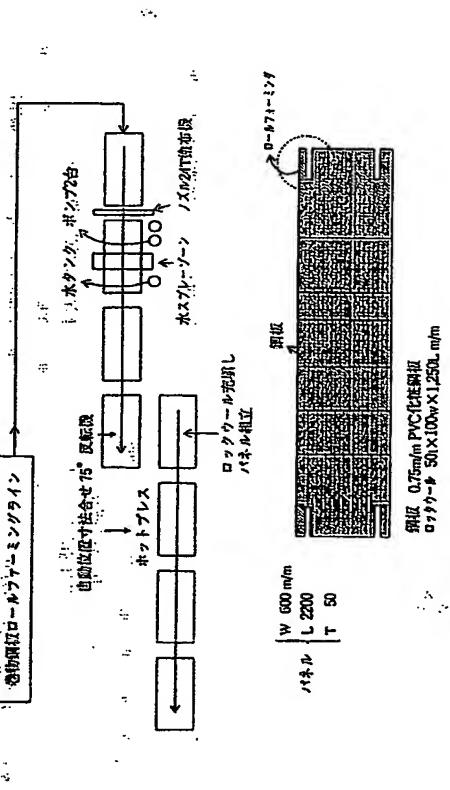


図3.25 23℃に於ける圧縮せん断接着剛性 (兆アラ)



滑移剪断強度	ピード盤付25mmピッチで250kg/m ²
水 量	約30g/m ²
フレックス系数	70°C 2分 0.1kg/cm ²
ライスピード	1枚約17.5秒

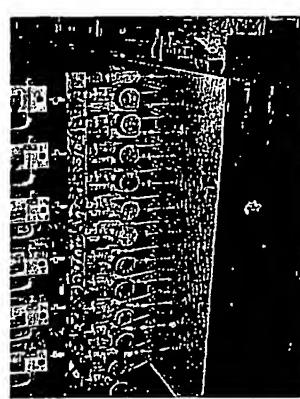


図3.27 自動ガスによるピード加工

KU908/S/Wの接着試験のデータを表3.20に示す。また、KU-1とエボキシ系接着剤用接着剤パネルボンドE250との混成割合と接着強度の比較を図3.23～3.25に示す。

又自動盤方式でのKU810f/L/PSのパネル製造要例を図3.26～3.28に示す。
〔著者：岩田敬治、岩田敬治会社、I.P.326、昭和63年〕

2) Janusz Korakiewicz, Adhesion (GBR) 13, 114-141 (1989).

3) “ポリウレタン樹脂ハンドブック”，岩田敬治編（日刊工業新聞社）。

4) 水田（三洋成工鶴川）、並葉技術研究会セミナー「接着強度が月22日（東京）」。

5) Janusz Korakiewicz, Adhesion (GBR) 13, 114-141 (1989).

1) 2-allyurethane's Chemistry and Technology Part

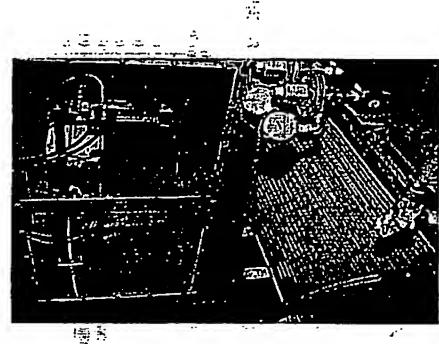


図3.28 接着剤への水スプレーーン

3.4 反応型二液ウレタン接着剤

堀 照夫

はじめて
ポリウレタン (PU) 接着剤は約50年前にマイエル社がDesmodur/Desmocellとして上市して以来、イソシアネート化合物の多様な接着性により年々その用途を広げてきた。今では、プラスチック・皮革・ゴム・繊維・木材・金属等に広く使用されており、その生産量も約3.3万tと昔われている。PU接着剤がこのような多様な接着剤に幅広く用いられているのは、イソシアネート基が高い反応性と活性を有し、各種化合物の特性を活かした幅広い接着剤設計、ウレタン結合や尿素結合による接着力と基材表面への物理的結合性による接着力の向上、耐水・耐薬品性などの化学的性質など、その点に加え、常温に近い温度でも硬化が可能なことにによる。

反応型二液 PU接着剤は、一液型と比べると、配合の手順・配合液のポットライフの問題はあるものの、接着強度の点からは優位であり、アリゲーター等の充填装置もあり PU接着剤の主流を占めている。中でもその最大的の用途は、食品包装用ティート剤であり、企 PU接着剤使用量の約1/2を占めている。

一液反応型ウレタン系接着剤は過酸化・無発泡型の回路や他の樹脂との複合化により新しい機能を与えるににより今後更に応用範囲が拡大すると思われる。

文獻

1) 2-allyurethane's Chemistry and Technology Part

2) Janusz Korakiewicz, Adhesion (GBR) 13, 114-141 (1989).

3) “ポリウレタン樹脂ハンドブック”，岩田敬治編（日刊工業新聞社）。

4) 水田（三洋成工鶴川）、並葉技術研究会セミナー「接着強度が月22日（東京）」。

5) Janusz Korakiewicz, Adhesion (GBR) 13, 114-141 (1989).

6) 2-allyurethane's Chemistry and Technology Part

7) Janusz Korakiewicz, Adhesion (GBR) 13, 114-141 (1989).

8) 2-allyurethane's Chemistry and Technology Part

系としてプリントマシンの分野で実用化されている。) やカルボン酸基含有ポリウレタン樹脂をカルボジイミド化合物やオキサリジン化合物等で硬化することも検討されているが、基本的には分子中に複数の活性水素基（通常はOH基）を有する化合物（主剤）と、NCO基を有する化合物（副剤）を無溶剤のまま、あるいは溶剤に溶解して、あるいは水性化して用いる。さらに、用途に応じ無機化合物や安定剤・触媒・接着性付与剤等を併用することも多い。

3.4.1.1 活性水素化合物

活性水素化合物にはアミンやカルボン酸・活性メチレン基をもつものもあるが、通常PU接着剤に使用される原料の大部分はOH系化合物である。表3.21に代表的な原料をあげる。反応型二液 PU接着剤では、これらの化合物は主剤としてそのまま使い、場合とシシジアネートで変性し、分子量や凝集力を調整して用いる場合がある。（図3.29）。

3.4.1.2 シシジアネート原料

PU接着剤の製造によく用いられるシシジシアネート類を表3.22にあげる。反応型二液 PU接着剤の製造にどうして用いられる場合には、これらシシジアネート類はアダクタド体・ビュレット体・リマーブル・ブジボリマーブル等に変性し、抽出あるいは熱脱溶留の手段で半反応のシシジアネートモノマーを精製して使用される。其性の目的は、蒸気圧の低下・直能基数やNCO含有量、粘度等の調整にある。表3.23に各種接着剤の構造をあげるが、シリメリックMDIやDesmodur RP等の蒸気圧が低い

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価格：1,500円

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Appendix B

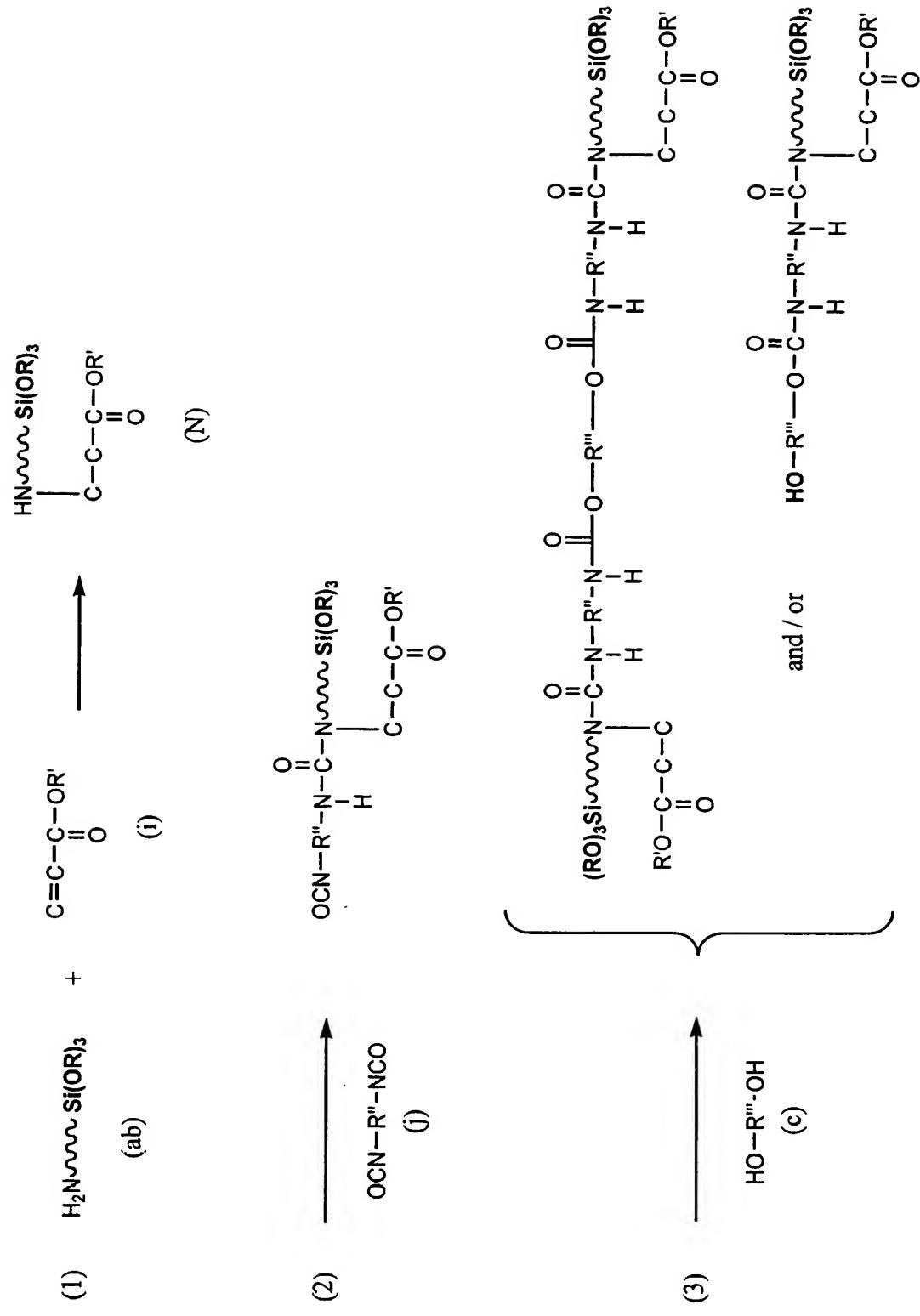
Translation

Table 3.18 Effect of Isocyanate Group Content On Molecular Weight Of Prepolymer

GPC chart	(a)	(b)	(c)
Mobile phase:THF			
Flow rate:1ml/min			
Isocyanate group content	15%	9%	6%
Peak No.(composition)	Molecular weight converted with polystyrene		
8 pre-trimer	—	5760	6000
7 pre-dimer	4310	4310	4450
6 Basic unit	2550	2560	2640
5	—	—	—
4 iso-tetramer	529	541	565
3 iso-trimer	446	456	476
2 iso-dimer	361	368	383
1 iso-monomer	253	259	271
Number average molecular weight	567	690	1402
Weight average molecular weight	1657	2910	4549
Viscosity mPa·s [25°C]	5900	13000	15800
* Polymeric MDI prepolymer			

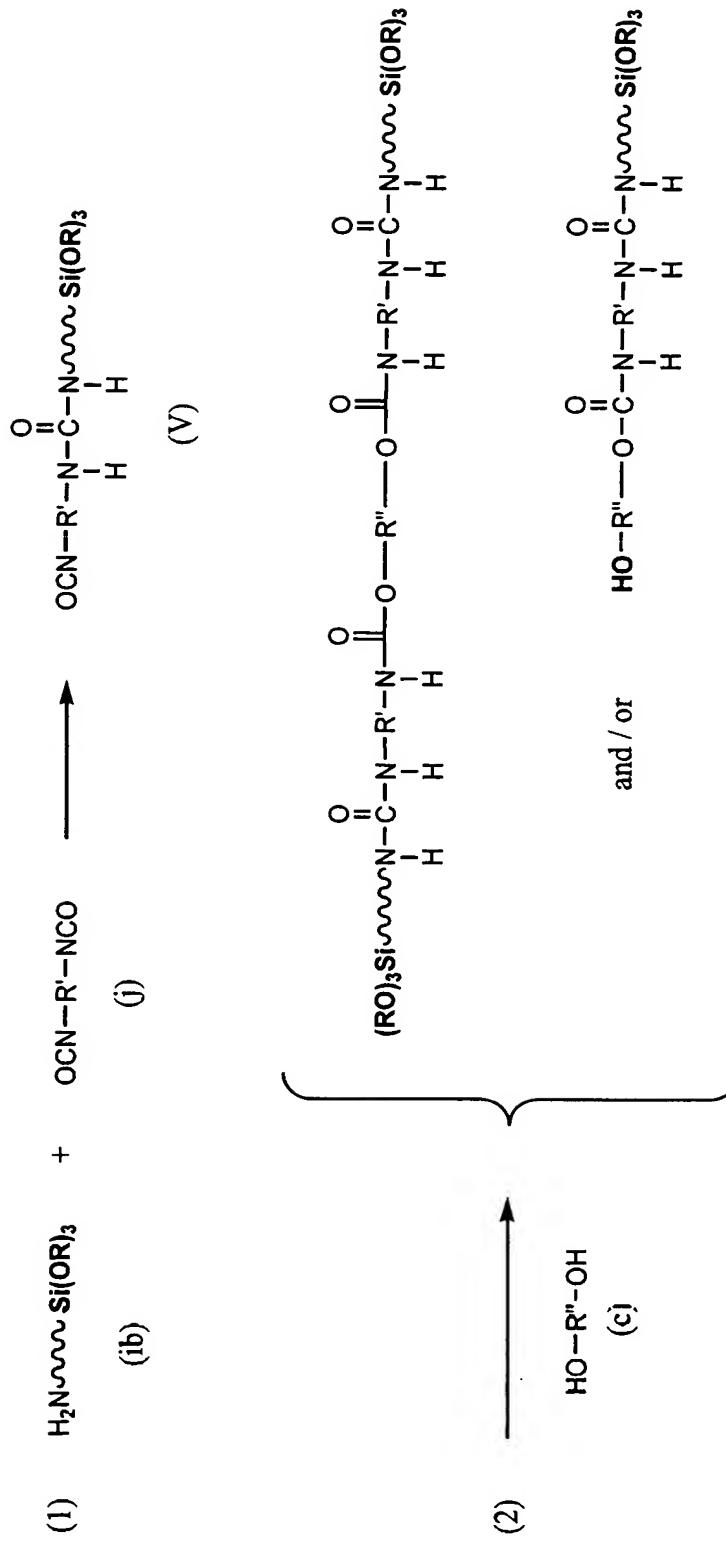
Appendix C

Claim 46



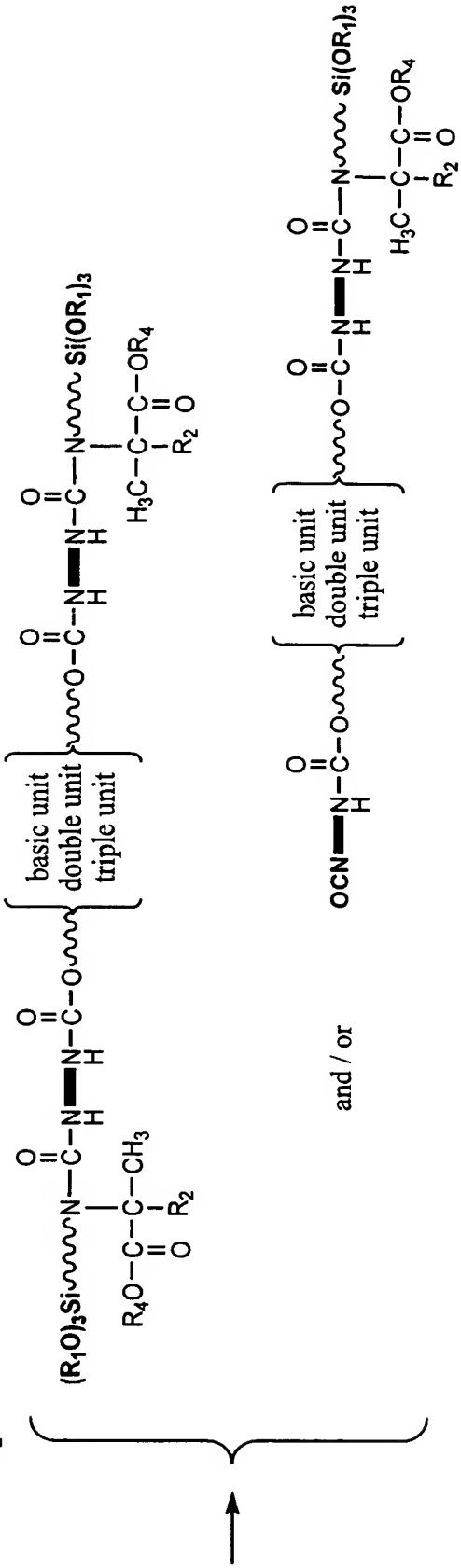
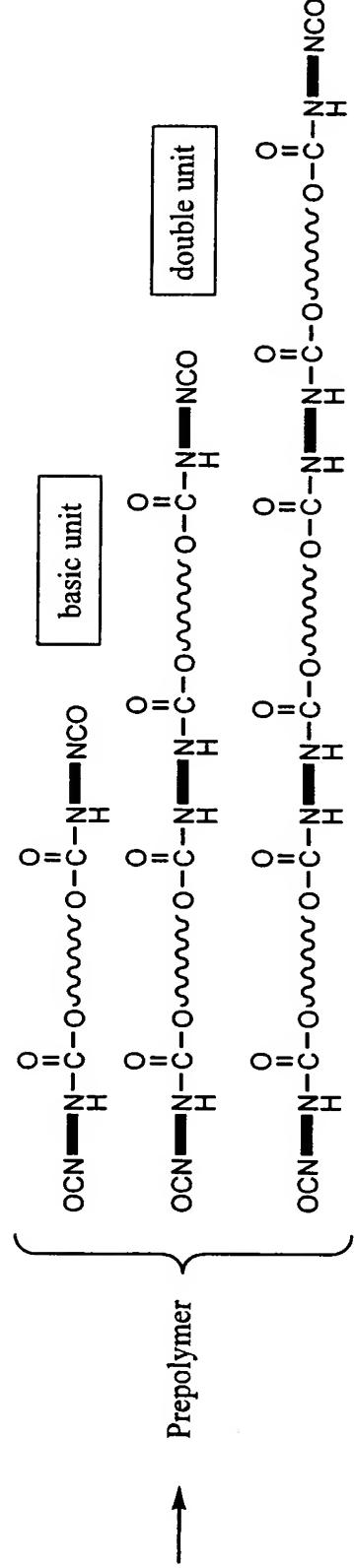
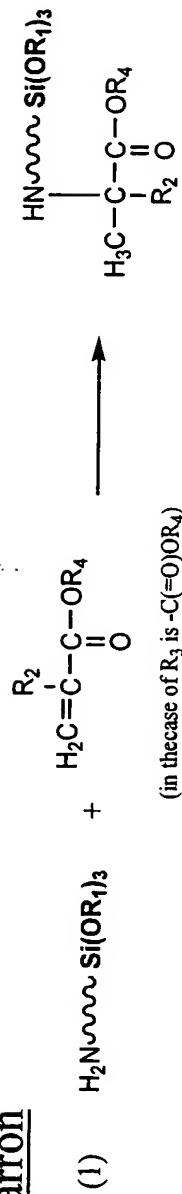
Claim 50

Appendix D



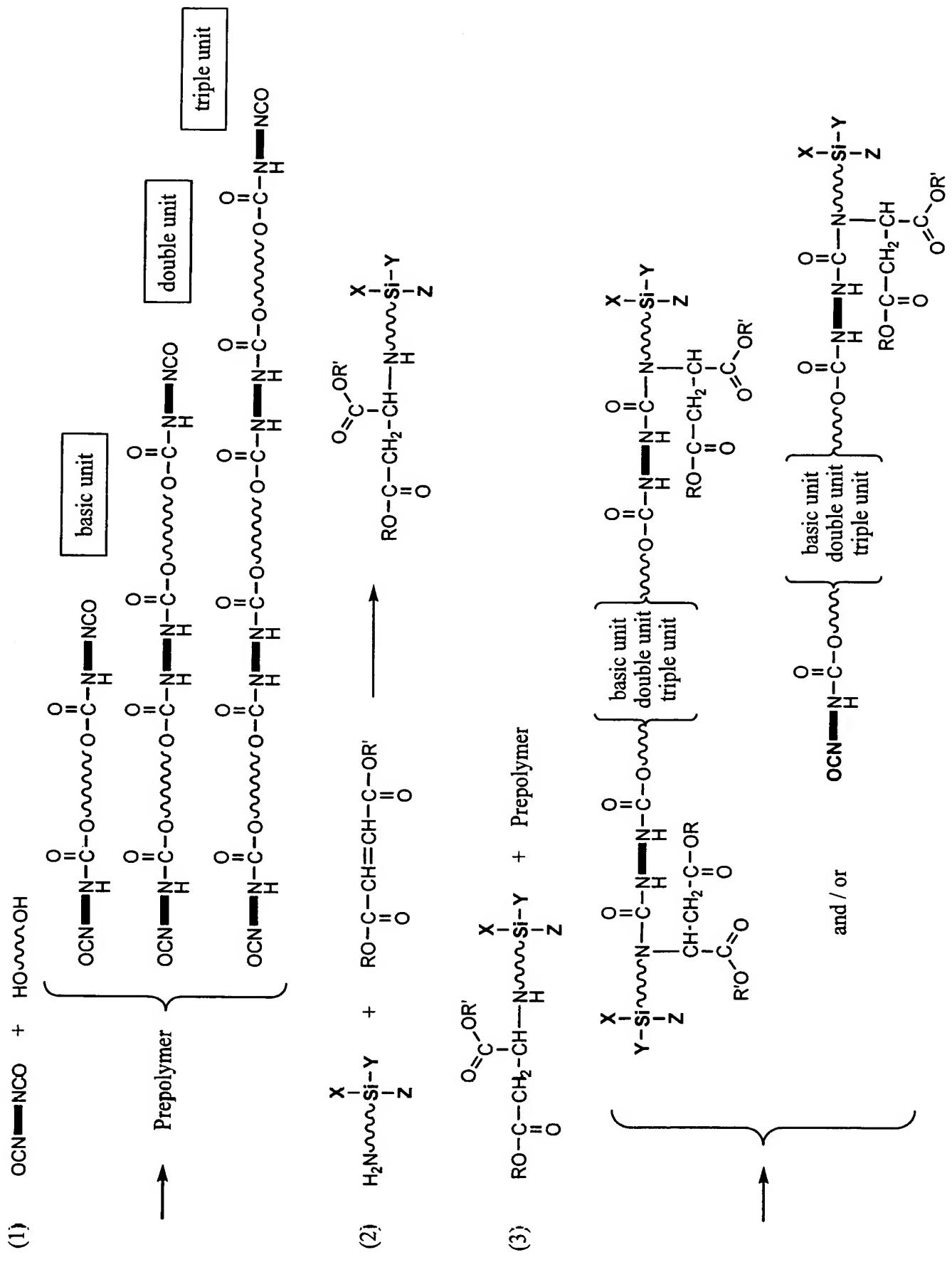
Appendix E

Baron



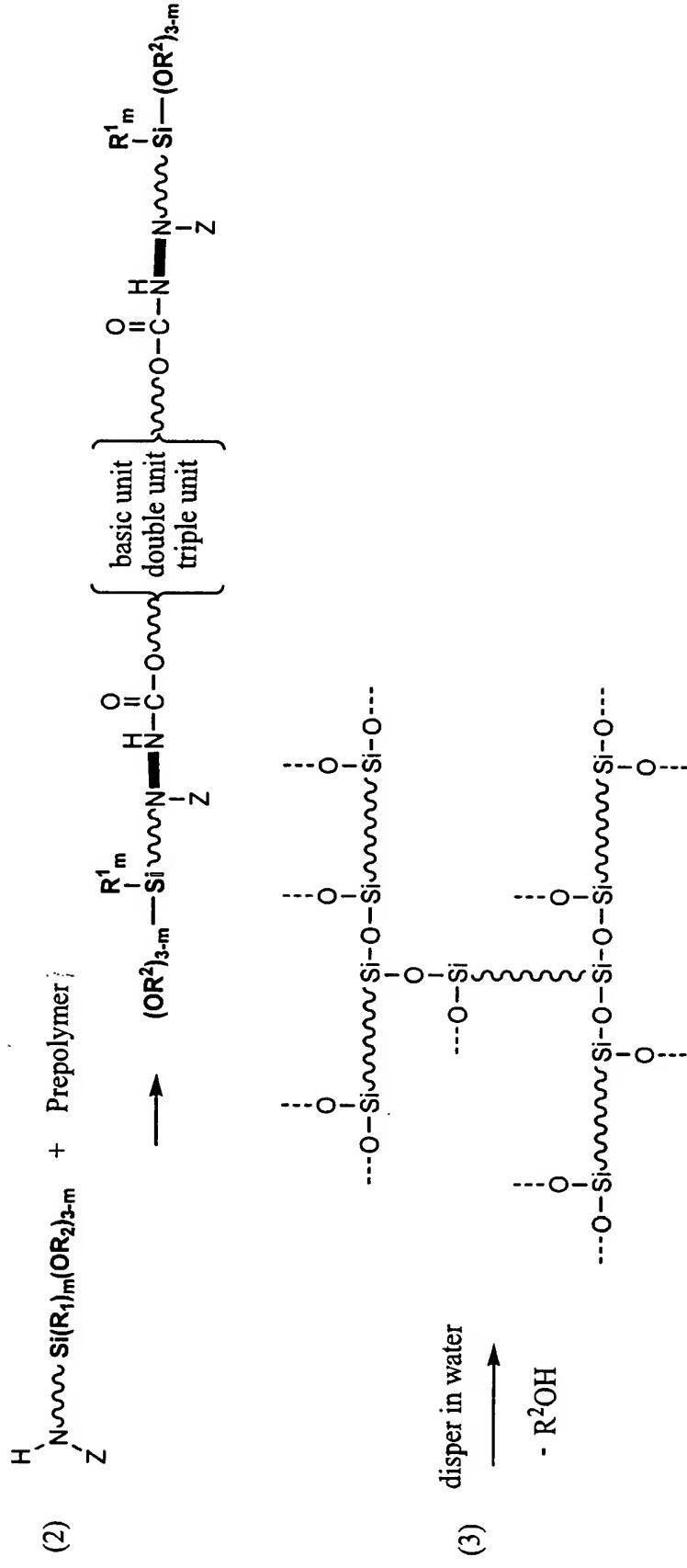
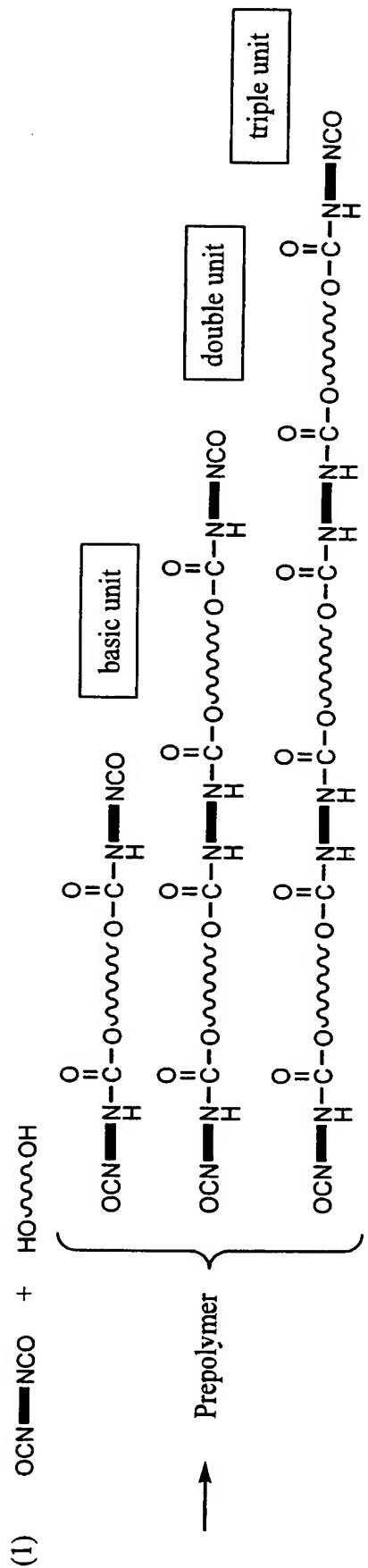
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Appendix F



Krafčík

Appendix G



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